

SCIENCE.

FRIDAY, MAY 6, 1887.

COMMENT AND CRITICISM.

DURING THE CENTENNIAL YEAR some of our leading geologists in the United States and Canada conceived the happy thought of calling an international congress of geologists for the purpose of agreeing upon such important though subsidiary matters as the colors by means of which the different geological formations should be expressed, the terms that should be applied respectively to these formations, and also upon the far more important problem of the limits and values of these different formations. The first session of this congress was held in Paris in 1878, the second session in Bologna in 1881, and the third session in Berlin in 1884. The third session found the preliminary difficulties so far cleared away that some definite and tangible results could be attained; and it was decided to make an attempt to embody these provisional results in some work which should include as many as possible of the difficulties to be encountered by any plan of unification, and at the same time be one with which the largest possible number of geologists were familiar. This additional precaution was adopted in order that whatever steps might be taken should be well advised. This was the reason for the selection of the continent of Europe as an area upon which to test the proposed classification and coloration schemes. Not only are there more geologists and larger geological collections in Europe, but the fact that each of the countries of Europe supports its own geological survey, and employs its own methods independently of all the rest, has for its consequences that there are more differences of opinion among geologists on the continent of Europe, both in important matters and in matters of detail, than in all the rest of the world put together. If, then, a compromise could be effected which would satisfy the conflicting notions of European geologists, it was reasonably sure that a system of unification for the whole world could be arranged. It is true that there are some questions to be settled upon which European geology can shed but little light, but they are not numerous, and they can certainly

be adapted to the rest of the general plan when that has been decided upon.

The congress restricted to each of the 'large countries' of Europe—to wit, France, Spain, Austro-Hungary, Russia, Scandinavia, Germany, and Great Britain—the right to become a *subscriber* to the proposed geological map of Europe, to be issued under the direction of a specially appointed committee of the congress. The number of copies of the map to which each subscriber is entitled is one hundred, and the price one hundred francs per copy. The American committee of the congress, feeling that the questions involved were of universal and not of merely European interest, sent a request to the committee of direction, asking that the United States be included in the list of subscribers. The response of the executive committee to this request was favorable. The object of the American committee is to get the names of one hundred institutions or individuals as subscribers to the map, so that the United States can occupy the same position among the *grands états*, through these private subscriptions, that Germany, France, etc., occupy by reason of the direct subscription of their governments. For the purpose above indicated, a circular was mailed by the American committee to one hundred and fifty institutions of learning and original research six months ago. It was then thought that the one hundred copies would be entirely exhausted by such institutions at once. As this has not proved to be the case (largely owing to the time at which the circulars were sent out), the American committee, at its Philadelphia meeting last December, decided to send out another, and, in addition, to invite a few scientific men to take advantage of the same privilege. Up to the present date, but fifty subscribers have sent in their names. In case of failure to secure one hundred subscribers, the committee must either pay the cost of this number of copies (\$2,000) itself, or ask the comité directeur to withdraw the United States from its list of subscribers.

TWO HUMAN SKELETONS have been discovered in the lower quaternary deposits, in a cave on the banks of the Orneau, in the commune of Spy,

province of Namur. The remains have been examined by Professor Fraipont, who discusses the subject in the Bulletin of the Royal Belgian academy. As we have not seen a full account of the finding of the remains, we confine ourselves to giving the report in *Nature* by A. H. Keane, who says that they were found in undisturbed strata, together with remains of *Rhinoceros tichorhinus*, *Elephas primigenius*, *Ursus spelaeus*, *Hyaena spelaea*, *Felis spelaea*, the horse, wolf, sheep, and other now extinct and surviving pleistocene animals. This fauna, and the character of the coarse flints occurring in the same strata, would seem to indicate that these men must have lived during the early period of the mammoth, and long before the beginning of the reindeer age.

"M. Fraipont's study of these remains," says *Nature*, "makes it thus abundantly evident that they belong to the Neanderthal type. The two skulls even serve as a sort of missing link between the Neanderthal and the others usually referred to the same race. This race, whose presence in Europe during the early mammoth age has now been clearly traced from Staengenaes in Scandinavia to Olmo in Italy, seems in a way to have been resuscitated by the fortunate discovery in the limestone cave on the banks of the Orneau. Their dry bones again assume flesh and blood, and science is enabled confidently to describe the men of Spy as a short but far from 'feeble folk,' thick-set, robust, walking knees foremost, and with a figure somewhat analogous to that of the modern Lapps. Their broad shoulders supported a long, narrow, and depressed head (different, therefore, from that of the true Papuan, which is long, narrow, and high), with very prominent superciliary arches, enormous orbits, low and retreating brow, high and massive cheek-bones, and receding chin."

It will be remembered that B. Dawkins's critical researches on human remains of the lower quaternary resulted in the discovery of the fact that their exact age cannot be proved, and that they are probably of far younger origin. Besides this, we call to mind Virchow's researches on the famous Neanderthal man, whom he found to have been very old and crippled, probably unable to support himself, and therefore not a type of his race. For these reasons we defer a fuller report until the facts shall be better known. The existence of man in the lower quaternary cannot be doubted, as

numerous stone implements have been found in deposits of that period. The discovery of human skeletons belonging to this age would be a very important addition to our knowledge.

THE RE-ISSUING of the famous 'Vestiges of the natural history of creation' in Mr. Morley's universal library, makes one realize the enormous step that modern biology has taken. This work, it is hardly necessary to say, was published anonymously, but the authorship was afterwards acknowledged by Robert Chambers. It is a popular statement of evolution fifteen years before the 'Origin of species,' and is sometimes spoken of as a very remarkable anticipation of Darwinism. But it failed to show any proof of a motive power, and does little to lessen the originality of Darwin's work. Chambers is very deeply concerned in showing that his views are not opposed to religion, and devotes much space in this cause. Yet this book was received with a storm of denunciation which it is difficult now to appreciate. This the author bore very philosophically; for, as he explained, his design in not putting his name to the book was "not only to be personally removed from all praise or censure which it might evoke, but to write no more on the subject."

THE LATEST COPY of the 'Pilot chart,' a monthly publication for the guidance of mariners, shows that there are to-day eleven dangerous wrecks right in the path of vessels in the coasting trade along the eastern coast of the United States. In any other country on the civilized globe a man-of-war or a government vessel of some description would have been despatched to destroy these wrecks as soon as reported. There is nothing, not even an iceberg, more dangerous to navigation than a water-logged 'derelict.' Yet up to the present time there is no one in the United States with the necessary authority to order a vessel out to remove these dangers from the pathway of our merchant marine. Time after time the attention of congress has been called to this subject, and the officers in charge of the 'Pilot chart' have repeatedly urged that a small appropriation be made to enable the navy to maintain a small ship for the purpose of removing floating dangers as soon as they are reported. But there is no one so directly interested as to spend time and money in hanging about the doors of congress to see that this recommendation is considered. In

consequence, year follows year, and the very sensible recommendation is unheeded. It is estimated by a naval officer who has given a great deal of attention to this subject that the actual annual loss to the merchant marine of the United States from striking upon these unmarked obstructions is equal to at least ten per cent of the losses from all other causes combined. The cost of building and maintaining the necessary vessel to remove these obstructions would be more than saved in the first year by the prevention of losses to coasting-vessels and transatlantic steamers which are jeopardized by the failure of the government to do its duty in this respect.

EXPLOSIONS IN COAL-MINES.

'A REPORT by W. N. and J. B. Atkinson, inspectors of coal-mines for the north of England,' recently published, is a very valuable contribution to our knowledge of an intensely practical subject, viz., the causes of explosions in coal-mines; and it is simply wonderful, considering how much this question has been investigated during the last hundred years, that some of the most important facts should not have been correctly apprehended or fully appreciated until this late day.

The nature of one cause of explosions, fire-damp or coal-gas, was demonstrated long ago, and guarded against by the invention of the safety-lamp. But that there must be some other cause at least equally potent has long been evident to thoughtful minds, from the fact, that, where the safety-lamp is in general use, explosions are still distressingly frequent and fatal. Thus official statistics for the years 1850 to 1885 show, in the United Kingdom alone, an annual average of fifty-six fatal explosions, the annual loss of life for the same period averaging two hundred and thirty-seven.

The report of the Messrs. Atkinson shows that the dust in coal-mines is now the chief explosive substance, the explosions usually resembling those in the large flouring-mills of Minnesota. This is not a hasty or foregone conclusion on the part of the authors, but it has a broad basis of experience gained by the direct and careful investigation of many important explosions. The discussion is able and thoroughly scientific, for not only is every statement abundantly fortified with facts, but it is made very clear in every case that no other view is tenable.

In all the collieries of the north of England the coal-seams lie at a considerable depth below the surface, with which they are connected by at least two shafts, — a *downcast* for the admission

of fresh air, and an *upcast* for the escape of the foul air from the workings. The circulation is usually maintained by a furnace at the bottom of the upcast shaft. The fresh air passes from the downcast by straight roads, from which lateral escape or leakage is prevented, to the working faces, and thence returns by other roads and through the abandoned parts of the colliery, where the coal has been removed and the roof allowed to fall in, to the upcast. The intake airways are usually the oldest parts of the workings, and are also the main avenues for hauling out the coal and for the ingress and egress of men and horses; while the return airways are rarely used for any other purpose than the passage of the foul air.

Fire-damp or light carburetted hydrogen exists in all the coal of this district, and issues constantly from the freshly exposed surfaces in the working places; but the ventilation is usually so efficient, that the gas cannot be detected even along the return airways, and it is very rarely observed on the main intake roads traversed by large volumes of fresh air, their surfaces having long exhausted themselves of gas. Naked lights are often used in the outer portions of the intake roads, and locked safety-lamps, as a rule, in all other parts of the colliery. Observations are cited which show, that, while one volume of fire-damp to fifteen volumes of air is required to make an explosive mixture, in the first half-mile of the intake roads the proportion cannot exceed one volume of fire-damp in fifteen hundred volumes of air. And yet it is exactly in this part of the colliery that the explosions are most frequent and violent.

The coal is largely of a tender or dusty nature; and, although the shafts are usually wet, the working planes are, for the most part, quite dry, and the air especially, although moistened by its passage down the wet shaft, becomes very dry through the rise of temperature due to the fact that the temperature of the ground increases downwards.

The return airways, where the fire-damp is most abundant, are usually quite free from dust, and at the working faces the dust is not often a serious evil. But the principal accumulations of dust are found along the roads through which the coal is hauled, i.e., the intake airways. It is especially abundant where the coal is hauled by engine-power, or at a high rate of speed. The dust is shaken and blown out of the cars by their rapid motion against strong currents of air, and flies as a cloud along the top of the train. The heavier particles fall to the bottom of the roadway, and the lighter particles form a deposit on the upper

parts as well as on the floor. This fine dust is not only found on horizontal surfaces, but it exhibits the property of sticking to timber, stone, and coal, something like soot hanging in a chimney, being sometimes from one to two inches thick on vertical and overhanging surfaces. In dusty mines it is often necessary to remove the dust on the floor of the roadway to prevent the tracks from becoming blocked; but the upper dust is not interfered with. Only one pound of dust to one hundred and sixty cubic feet of air is necessary in order to form an inflammable mixture, and this proportion is often largely exceeded on dusty roads.

Coal-dust in mines is often referred to as constantly present in the air. This is not so, except to a limited extent. The velocity of the air is rarely sufficient to carry dust any considerable distance. When dust is largely present in the air, it is due to some disturbing cause other than the ordinary movement of the air. The rapid passage of cars against the air-current raises a cloud of dust from them; the passage of men and horses stirs up the bottom dust; the hewer at the working face raises about him a thin cloud of dust; the concussion of a blast, or wave of air caused by a heavy fall of stone, fills the air with dust; but in the absence of some such cause the dust is quiescent, and after its disturbance by any cause it soon settles down again. The fine, soot-like, upper dust is, however, extremely inflammable, even when not disturbed; and after explosions the greatest amount of violence is observed on those roads likely, before the explosion, to contain the most of this kind of dust. After explosions, the dust thrown into the air and ignited is found to be very generally coked.

Not only has there been heretofore a general misconception as to the nature of the explosive substance, but also as to the actual cause of death of the victims. This may occur from *flame, force of the explosion, falls of stone and timber, suffocation by dust, or after-damp*; but the evidence goes to show that the immediate cause of death, in almost all cases, is after-damp, i.e., the gases resulting from the explosion. After-damp produced by the explosion of ordinary fire-damp consists of carbonic-acid gas, nitrogen, and water vapor; and death results from slow suffocation, due mainly to the exhaustion of the oxygen in the air.

But the after-damp from explosions of coal-dust is much more rapidly fatal, and evidently contains some more poisonous constituent. Analysis shows that this is carbonic oxide. Miners frequently work without serious inconvenience in air containing so much carbonic acid as almost to ex-

tinguish their lights; but a proportion of carbonic oxide so small as to have no appreciable effect on his light will cause the death of the miner in a few moments, sometimes almost instantly, his light continuing to burn after his death until the oil is exhausted. It has repeatedly happened that miners who were outside of the roads traversed by an explosion, and uninjured by the explosion itself, have been cut off by the after-damp, and have perished in trying to force their way through it to the shaft. In fact, the most serious features of dust-explosions are, that, unlike gas explosions, they occur absolutely without any warning, and mainly near the shafts, thus preventing escape from any part of the mine.

Of six typical explosions occurring in the north of England in the years 1880 to 1885, five occurred in Durham, in dry dusty mines, and were undoubtedly dust-explosions. The total loss of life was three hundred and thirty, or an average of sixty-six for each explosion. The sixth explosion occurred in the Whitehaven colliery, which extends three miles under the sea, and is wet, and free from dust. This was clearly and purely an explosion of fire-damp, and the most extensive of its kind within the experience of the Messrs. Atkinson, and yet only four lives were lost. This mine was not only free from dust, but the explosion was limited to the most remote, deepest, and most poorly ventilated portion of it.

The following conclusions are warranted by the study of these explosions: all the explosions were limited to one plane or level of the colliery, in no case ascending or descending vertically so as to continue the explosion on another plane. The single gas explosion was remote from the shafts, and so cut off from communication with higher or lower workings; while all the dust-explosions extended to or even crossed the down-cast shafts, but could not follow the shafts up or down because they are wet and free from dust; and, in general, the flame and violence of the dust-explosions were confined to those roads on which there was much coal-dust, their intensity varied with the amount of dust, and they were often arrested at places where the roads were wet or damp. In no case were the return airways, where gas is always most abundant, seriously affected; and the intake airways also escaped where not used for handling coal. Since the dust is naturally heavy and quiescent, it can only be ignited when some disturbance throws a cloud of it into the air in the presence of a flame. One of the dust-explosions was probably initiated by a small explosion of fire-damp; but all the others were simultaneous with the firing of shots of gunpowder in stone; and it is concluded that the con-

cussion of the shots threw the dust into the air, and the flame of the shots ignited it. Gunpowder is in daily use in the collieries, but usually on the working face, where there is insufficient dust to start an explosion. In every case but one, however, the shots causing the explosions were fired where the miners were enlarging the main roadway, and where the dust had been quietly accumulating for years. The fresh air passing these points at the times of the explosions varied from twenty-three thousand to sixty-one thousand cubic feet per minute, so that any accumulation of fire-damp was impossible. Dust in the air may be ignited by an open light, but not by a safety-lamp. One of the curious features of the dust-explosions is, that they exhibit but little force or violence near the point of origin, but seem to require a distance of from fifty to one hundred yards in which to gain headway. Once initiated, the explosion is self-propagating, and rapidly increases in violence; the normal condition, after an explosion is fairly established, being (1) a wave of air preceding the explosion and filling the air in the roads with coal-dust, (2) flame following instantly into compressed air charged with dust.

Various popular ideas about explosions, such as that they 'face the wind' or travel against the fresh air, favor the coal-dust theory.

Under the head of remedial measures, the authors of the report note that watering the roadways, which has been practised for many years as a mere matter of convenience, is of little avail as a means of preventing explosions, since the upper dust in every instance is left undisturbed. Gunpowder should not be used in dusty places without first thoroughly dampening the dust. The accumulation of dust in the roads may be diminished by reducing the velocity of the air, which can be done by enlarging or doubling the roads; by reducing the speed of the coal-cars; or by wetting or covering the loaded cars. Extensive dust-explosions could be prevented by keeping occasional sections of the roads thoroughly wet.

Since the dryness of the mines is due mainly to their high temperatures, a large volume of air entering at 40°, and raised in its course to 70°, exercising an enormous drying power, the following more drastic remedy is also suggested: to raise the air entering the mine to the temperature of the mine, and saturate it with moisture. It could then exercise no drying power, and the natural moisture of the mine would come into play, changing dry mines to damp mines. The principal objections to this plan are the expense, and the greater discomfort to the miners of working in warm, moist air.

A more recent contribution in the Proceedings

of the Yorkshire geologic and polytechnic society, for 1886, recognizes the great importance of coal-dust in colliery explosions, and shows, that, contrary to the generally accepted theory, important explosions are much more likely to occur when the barometer is high than when it is low. The explanation is, that, while a high or rising barometer tends to prevent the escape of gas from the coal, it is also usually accompanied by a dry atmosphere, which renders the coal-dust lighter and more inflammable.

ELECTRIC RAILROADS IN THIS COUNTRY.

AN interesting article on electric railroads in the United States, by T. C. Martin, appeared in a recent issue of the *Railroad Gazette*. The progress already made in the application of electric energy as a motive power for street-railroads, as reviewed in Mr. Martin's article, cannot fail to be encouraging to all engaged in the development and exploitation of inventions in that particular field of industry. Nor is it without interest to scientific men and the public generally. One electric road in Baltimore, equipped by the Daft company, has been in successful and profitable operation about two years. A road in Los Angeles, Cal., built by the same company, has been running several months, and is soon to be extended to nearly double its present length. This company is also constructing and equipping electric railroads in Pittsburgh, Penn., and Orange, N.J., and will construct others at Mansfield, O., and Ithaca, N.Y.

The Van Depoele company of Chicago is able to show a good record in the matter of electric-railroad construction. Roads using its system of electric propulsion are running at Port Huron and Detroit, Mich.; Appleton, Wis.; Windsor, Ont.; Scranton, Penn.; and Montgomery, Ala.; which last-named city has eleven miles of road in operation. This company is now constructing roads at Lima, O., and Binghamton, N.Y.

In Denver, Col., there is an electric road, constructed on what is known as the Short-Nesmith system, in which the current conductor runs in an underground tube, contact being effected through a five-eighths inch slot between the rails. This road crosses eight horse-car tracks, five steam-car tracks, and a two-hundred-foot bridge.

A three-mile road in Detroit uses the Fisher system of equipment, and a short line in Pittsburgh is being equipped on the same system. A nine-mile section of road in San Diego, Cal., intended for high speed, will be constructed by a company which has just completed a double-track road in Kansas City. These two are overhead conductor roads. A Philadelphia company, which

has already constructed a short line in that city, is at present busy on the construction of mining roads; one of these, now under way, being six thousand feet long, and wholly in the mine. The Sprague company of this city has completed a short road for a Boston sugar-refinery, and is now making estimates for street-lines in several of our larger cities. This company has made a series of tests with storage-batteries for street-car purposes, which have given very satisfactory results.

A cross-town line in this city is to be equipped with the Bentley-Knight conduit system, — a system specially devised to meet the requirements of street-car traffic in crowded city streets. A road in Allegheny City, Penn., is contracted for by the Bentley-Knight company. On the Eighth Avenue road in this city, and also on a road in St. Louis, the Julian storage-battery system has been tried, and it is claimed, with results showing economic features as compared with horse-traction.

After referring to the many systems still in the purely experimental stage, Mr. Martin concludes as follows: "At Ansonia, Conn., an electric road, three and a half miles long, from Derby to Birmingham and Ansonia, using overhead wire, has been contracted for. It will be used for both freight and passengers, and power to drive the dynamo will be taken from the Housatonic dam. At Newton, Mass., a road is to be built by a company already formed; one is proposed for Worcester, Mass. At Brookline, Mass., two will soon be in operation, and one each is in view at Bangor and Biddeford, Me. Two roads are contemplated in Brooklyn, one at Coney Island, and one at Rockaway. Pelham Park, N.Y., is to have a road this summer, and Asbury Park, N.J., is advertising for bids on another. Franchises are asked for a road in Jersey City and Bayonne; and Plainfield, N.J., is also wanting a road. In Pennsylvania, Scranton, with one successful road, is to have another, and probably two. A road is to be built from Carbondale to Jermyrn, four miles. In Reading, the Perkiomen Avenue company proposes to adopt electricity. Harrisburg is to have a road, and it looks as though, before the end of the year, Pittsburgh will have half a dozen. Down south, steps have been taken to construct new electric roads, or adopt the system on old roads, in Jacksonville, Fla.; Pensacola, Fla.; Birmingham, Ala.; Selma, Ala.; Atlanta, Ga.; and Fort Smith, Ark. Among roads spoken of in Ohio are several at Cincinnati, Cleveland, Tiffin, and other places. Wichita, Kan., is proposing to adopt electricity for its street-cars. Lincoln, Neb., has formed a company to operate an electric railway from the business part of the town to the stock-yards. In San Francisco a road is to be

built on Fillmore Street hill, and roads are also wanted at San Jose and Riverside, San Bernardino county. If I were at liberty to do so, I could add to the above list about fifty names of places where, from present indications and movements, it is safe to say that electric roads will be running within a year."

EXPLORATION AND TRAVEL.

Sierra Leone.

WE give elsewhere a brief sketch of the tribes of Sierra Leone. Our knowledge of this country is principally due to the commercial companies which are established on the coast, and to the endeavors of the English and French to extend their colonies towards the interior. We find some very interesting notes on Sierra Leone in letters by Lieutenant Mathews, which were published in 1791; and his descriptions of the people are still true, though a long time has elapsed, and the slave trade was long since abolished. The first to enter the interior was Major Laing, who, in 1822, succeeded in reaching the sources of the Scarcies and Rockelle, the principal rivers of the colony. R. Caillié, on his journey from the Senegal to the Joliba (the upper Niger) and Timbuktu, and thence through the Sahara to Morocco, 1824-28, crossed the territory of the Mandingos, and gave an interesting description of their customs and mode of life. In 1843, W. C. Thomson explored the district north of the Scarcies River and Futa-Jalon, where the Scarcies, Gambia, and many tributaries of the Senegal and Niger, have their sources. In 1869, Winwood Reade, who was sent out by the London geographical society, explored the country between the Scarcies and Rockelle rivers, and after having reached the town of Falaba, Major Laing's farthest point, crossed the watershed and descended the Niger, which he followed a long distance. The latest important researches are those of E. W. Blyden, who travelled in the Susu country, north of the Scarcies, in 1872, and of J. Zweifel and M. Moustier, who were sent out by the French merchant Verminck for the purpose of discovering the source of the Niger (1879). They followed Reade's route as far as Falaba, and then turned south to the head waters of the Niger. Most of these routes run parallel to the large rivers. The tributaries which are crossed by these routes are little known, and much work remains to be done before the geographical features of the country and the ethnological character of its inhabitants will be tolerably well known.

The proposed French expeditions to the upper Niger will add considerably to our present knowledge of the interior parts of this district. Owing

to the hostility of the Marabout Mahmadu Lamine, two expeditions were formed last December to proceed against him (*Proc. roy. geogr. soc.*, April, 1887). The country to be traversed is little known, and topographical surveys will be carried on during the expedition. Besides this, Dr. Tautain and Lieutenant Quiquandon will explore the country adjoining the north-eastern boundary of Senegambia, which includes the country called Bakunu, between the desert and the upper course of the Niger. It was traversed by Mungo Park in 1796. A third party will survey the unknown part of the Niger, as far as it forms the boundary of Senegambia, and ascend the Tankiso, which has its source in Futa-Jalon, and has never been visited.

Asia.

H. E. M. James, F. E. Younghusband, and H. Fulford have made an interesting journey in a part of Manchuria which had hitherto not been visited by Europeans. They left Mukden, the capital of South Manchuria, on May 29, 1886, intending to ascend the Yalu River and to reach the point where the Chinese, Korean, and Russian frontiers meet. They were prevented from carrying out their intention by the impracticability of the upper valley of the Yalu. Therefore they turned due north, up one of the tributaries of the Yalu, crossed the main chain of mountains by a low pass 2,700 feet high, and came down the Tang-ho, an affluent of the main or western branch of the Sungari. They then visited the Chang Pei-shan ('ever white mountain'). It was found to be a recently extinct volcano, with a lovely blue pellucid lake filling the bottom of the crater, and surmounted by a serrated circle of peaks rising about 650 feet above the surface of the water. The loftiest of these was found to be 7,525 feet high, while formerly its height was estimated at 10,000 to 12,000 feet. The sides of the mountain are composed of disintegrated pumice, to which its conspicuously white aspect is due. There are no glaciers, but snow lies in the clefts all the year round. The Pei-shan forms the centre of the river-system of Manchuria; the Yalu, which forms the southern part of the Korean frontier, the Tumen, which forms its northern part, and the western Sungari, having their sources here. From here the party went to Kirin, descending the Sungari. While the rest of Manchuria is infested with robbers, the colonists and hunters of this district have managed to suppress them, and travelling is comparatively safe. Considerable difficulties were experienced owing to incessant rains, which made the rivers impassable. Numerous gold-diggings were met with, the most extensive being but a few marches from Kirin. Here

they staid for three weeks, and started on Sept. 3 for Tsitsihar, the capital of northern Manchuria, on the Nonni, a tributary of the Sungari. From Tsitsihar they turned south-east, and crossed a high, undulating, and perfectly uncultivated steppe, with numerous brackish lakes. At the shores of these lakes, earth containing soda and salt is gathered, from which soda and salt are made. Thus they reached Hulan, on the Hulan River, a few miles from the Sungari. The country all around here is very fertile, and is being rapidly settled, some of the towns having upward of 25,000 inhabitants. They visited the south-east corner of Manchuria, where the Russian, Korean, and Chinese frontiers meet, and returned to Kirin and Mukden. A great part of the country they traversed was never visited by Europeans, and the compass survey of their route will be very valuable (*Proc. roy. geogr. soc.*, Dec., 1886; April, 1887).

America.

La gazette géographique (April 21) says that Chaffanjon's explorations on the upper Orinoco have been successful, and that he has returned to Ciudad Bolivar.

Thouar's expedition, which was sent out to explore the Pilcomayo, is detained at Lagunillas, on account of the outbreak of cholera in Paraguay.

NOTES AND NEWS.

THE second annual meeting of the American economic association will be held in Boston and Cambridge, May 21-25, 1887. The meetings will, for the most part, be held in the buildings of the Massachusetts institute of technology; but one session will be held at Harvard university in Cambridge. The following is the programme, subject to revision: May 21 (evening), joint session of the American economic association and the American historical association, with addresses by the presidents of the two associations (Gen. Francis A. Walker and Prof. Justin Winsor), reception of both associations in the Museum of fine arts; May 23, report of the standing committee on transportation, 'Agitation for federal regulation of the railways' (by Prof. E. J. James), 'Long and short haul clauses of the federal railway law' (by Dr. Edwin R. A. Seligman), 'Some curious phases of the railway question in Europe' (by Simon Sterne, Esq.), 'Sociological character of political economy' (by F. H. Giddings, Esq.), and 'Mine labor in the Hocking valley' (by Dr. Edward W. Bemis); May 24 (forenoon), economic association, report of committee on trade on 'Condition and organization of retail trade,' report of standing com-

mittee on public finance on 'Municipal public works,' paper by Frank J. Goodnow on the 'Administrative aspect of municipal franchises and finance in Europe and America;' (afternoon), joint session of both associations (Saunders's theatre, Cambridge), papers by Hon. Carroll D. Wright on 'The study of statistics in colleges,' by Prof. E. J. James on 'Our legal tender decisions,' and by Dr. A. B. Hart on 'Finances of the American revolution;' (evening), meeting in Boston, paper by Professor Folwell on 'Economic theory,' paper by Prof. Richmond Smith on 'Wage statistics,' report on the Connecticut valley branch of the American economic association by Dr. E. W. Bemis (secretary), report of the secretary on the 'Condition and prospects of the American economic association;' May 25, both associations will go to Plymouth, and dine together at the Samoset House.

— A letter from Mr. Tebbutt in the April number of the *Observatory* states that the 'great southern comet,' to which we have already referred in *Science*, was first seen at Windsor, New South Wales, on the evening of the 28th of January. The tail was many degrees in length, and extended as far as the star Achernar in the constellation Eridanus, but no nucleus could be detected on that evening or on the evening of Jan. 30. On Feb. 1, although the sky was pretty free from cloud, not the slightest trace of the tail could be seen, owing to the brilliancy of the moon. No accurate observations were obtained, and the comet was not seen again. The *Revista do observatorio* for February, published by Dr. Cruls at Rio Janeiro, gives a sketch of the comet made on Jan. 24, 1887. The nucleus was then somewhere beyond the bright star α Gruis, invisible in the haze of the horizon; and the tail stretched up beyond β Hydrae, a narrow ribbon fifty-two degrees in length and about half a degree in width. At Cordoba no accurate observations could be made on account of the lack of a definite nucleus. Dr. Thome has expressed the opinion — though, as he says, the evidence is not such as would be accepted by astronomers as conclusive — that the comet is identical with the great comet of 1880, to which it bears a strong resemblance in its physical characteristics. The great comets of 1843, 1880, and 1882, and the comet discovered during the total eclipse of the sun of May, 1882, all seem to be moving in similar orbits, and doubtless belong to the same family, having formed at some earlier stage parts of a single body. The Melbourne comet is now, without doubt, to be added to the family, and there may be many other large comets in this stream, which pass by the sun unobserved. Dr. Meyer's

recent investigations show, that, if any one of these brilliant comets had passed perihelion in May, its position with respect to the sun would have insured its escape. Dr. Meyer is not inclined to admit the identity of the comets of 1843, 1880, and 1882.

— Commander F. E. Chadwick, of the navy, contributes to the May number of *Scribner's magazine* an important article, entitled 'The development of the steamship,' in which he describes the first experiments in steam-navigation, the early lack of faith in its possibilities, the obstacles that were overcome, the rapid improvements in steamships, the growth of ocean transportation, and the establishment of the great transatlantic lines. An especially interesting feature of the article is the description of the most famous of modern steamships.

— The publication of *The journal of education for New Brunswick* has met with such encouragement that it has been determined to enlarge it to a twenty-four page paper, to be published monthly, in the interest of teachers and students of the maritime provinces of Canada. The first number of this periodical will be published about the first of June next.

— Within three months of the appearance of the first part of the new series of his 'Butterflies of North America' (see *Science*, ix. 122), Mr. W. H. Edwards issues another, which is even more interesting than that, for two of the three quarto plates furnish abundant details of the early stages of butterflies, heretofore unknown, and including many not usually given by naturalists. The first of these is *Colias harfordi* of southern California, which the author has been able to raise in the east from eggs sent by Mr. Wright of San Bernardino, — a collector who has done much to develop our knowledge of the butterflies of that region. The other is *Neonympha gemma*, a southern insect, not uncommon in West Virginia. This last plate contains also *N. henshawi* of New Mexico, of which the egg also is given; and the whole plate, in delicacy of drawing and faithfulness of coloring, is matchless, and reflects the greatest credit upon all concerned. *Argynnis* comes in again for its share, one species, *A. coronis*, being figured, and another, *A. calippe*, having a page of its history recorded from the notes of Mr. Wright, from which it appears, that, in contrast to our eastern species, it flies in spring, and in spring only. It is much to be hoped that the Boston publishers (Houghton, Mifflin, & Co.) will be able to assure the author in a substantial manner of the growing appreciation of the public for such excellent work and costly outlay.

—The well-known Woburn rotation experiments, undertaken by Voelcker for the Royal agricultural society of England, have been frequently quoted as casting discredit upon the conclusions of the chemist regarding the manurial value of different articles of cattle-food (see article in *Science*, ix. No. 206, for an account of these experiments). The manure from animals fed with cottonseed-meal, in particular, showed no superiority over that from animals fed with corn-meal, although the former must have been much the richer in plant-food. Those, however, who interpreted the experiments unfavorably to the conclusion of the chemist, forgot that the soil is as important a factor as the manure in the production of a crop, and that upon an already fertile soil the direct fertilizing effects of manures may have no opportunity to show themselves; some other factor being present in relative minimum, and thus controlling production. In the last number of the *Journal of the Royal agricultural society*, Voelcker reports briefly upon the beginning of a similar experiment upon *poor soil*. Few details are given; but the general result was that the manure from cottonseed-meal greatly surpassed that from corn-meal, thus indicating strongly that the soil of the Woburn experimental field was too rich for the proper conduct of experiments with fertilizers, and giving a very plausible explanation of the abnormal results reached.

—A system of indicating the time at night throughout a district lighted by electricity from a central station has been patented by Patrick B. Delany, an electrician of this city. The system consists in causing all the electric lights in the district to fluctuate in intensity, in a predetermined manner, at proper intervals, and in such a way as to indicate the hour.

—Mr. E. C. Sanford of the Johns Hopkins university has republished, with an introductory note by Prof. Stanley Hall, his study of the manuscripts of Laura Bridgman, the famous blind deaf-mute now living, at the age of fifty-seven, at South Boston. The author has had access to almost all of the diaries and other writings which Laura Bridgman has from time to time written, and has given a valuable as well as interesting analysis of their contents. Her autobiography is given almost entire, and abounds in quaint errors, such as normally constituted persons would seldom if ever commit. These are sifted out and presented with much tact, and the whole study is an important contribution to the history of one of the most remarkable educations through which a human being ever passed.

—About two years ago, Mr. de Nicéville of the

Indian museum, Calcutta, sent for exhibition to the entomological society of London several series of Indian butterflies, which were universally regarded as distinct species, but which closely resembled one another, excepting that the conspicuous ocellated spots of the under surface of the wings of certain kinds found in the rainy season were replaced in other kinds which fly only in the dry season by more uniform, paler, and leaf-like markings, in which the ocelli are obsolete. He regarded these as probable instances of seasonal dimorphism, — a view which was vigorously combated by some of the members present at the exhibition. He has now proved his right to the belief in the case of four pairs, having raised one series of forms from eggs of the other (*Journ. Asiatic soc. Bengal*, 1886). These were species of *Ypthima*, *Mycalesis*, and *Melanites*, and it is the first time this phenomenon of seasonal dimorphism has been shown in tropical butterflies; it was supposed to be altogether related to the winter of temperate regions. Mr. de Nicéville believes that the obliteration of the ocelli is “an advantage to the insects during the cold and hot seasons, as at those times the vegetation is much more scanty and dried up, the insects live chiefly among the grass, and would consequently be easily seen were they not inconspicuously colored and marked; while in the rains, the vegetation being then very dense, they can hide themselves, and their conspicuous livery is no bar to their safety.” De Nicéville adds at the end of his paper (in which the early stages of *Ypthima* and *Mycalesis* are for the first time figured) that he could indicate “many dozens of Indian species” in which he believes seasonal dimorphism occurs, “including nearly every family into which butterflies have been divided,” but he “might again be accused of ‘guessing.’” Here is certainly an interesting and open field for the Indian entomologists, which even the tyro may till.

—Excavations for the foundations of the 1000-foot iron tower to be erected in the Champ de Mars, Paris, are being made. Each of the four members of the tower framework will rest upon a pyramid of masonry 26.24 feet high, to which it will be secured by anchor-bolts six inches in diameter. Four immense masses of beton, resting on a stratum of clay nearly fifty feet below the surface, will serve as foundations for each of the masonry pyramids; and the enormous weight of the whole will act as a counterpoise to insure the stability of the tower against the great wind-pressure to which it will be subjected.

—Messrs. Ticknor & Co., Boston, have recently published, under the title ‘American literature

and other papers,' a volume of essays by Edwin P. Whipple, in the introduction to which John G. Whittier says of the author that he was the ablest critical essayist of his time, and the place he has left will not be readily filled. Scarcely inferior to Macaulay in brilliance of diction and graphic portraiture, he was freer from prejudice and passion, and more loyal to the truth of fact and history. He was a thoroughly honest man. He wrote with conscience always at his elbow, and never sacrificed his real convictions for the sake of epigram and antithesis. He instinctively took the right side of the questions that came before him for decision, even when by so doing he ranked himself with the unpopular minority. He had the manliest hatred of hypocrisy and meanness; but if his language had at times the severity of justice, it was never merciless. He 'set down naught in malice.'

— The well-known researches of Warington have done much to elucidate the process of nitrification as it takes place in the soil. His latest paper (*Journ. chem. soc.*, Feb. 1887, p. 118) deals with the distribution of the nitrifying organism in the soil. Evidences of its presence were found to the depth of six feet, but it was neither abundant nor vigorous. The author concludes that nitrification is practically confined to the surface soil.

— The lactocrite, a new apparatus for testing milk, particularly with regard to its value for butter, is the invention of de Laval, also the inventor of the well-known centrifugal separator, which bears his name, and is designed to be used with the latter. The milk is first heated with its own bulk of strong acetic acid to which five per cent of strong sulphuric acid has been added. This treatment, continued for seven or eight minutes, suffices to set free the fat of the milk from its emulsified state. A glass tube with a narrow neck, properly graduated, is then filled with the milk, placed in a suitable holder in a disk which is attached to the centrifugal separator, and the latter set in operation. A complete separation of the fat is then effected in the narrow neck of the tube, where the amount is read off. The instrument is designed to enable creameries using the centrifugal to test the quality of each patron's milk; and it appears to be well adapted to this purpose. Several tests of its accuracy have been made of late. Sexhlet, in the *Milch Zeitung* (xvi. 14), reports that he obtained by it results agreeing within 0.1 per cent with those of his aerometric method. Sebelien (*Landw. Vers. Stat.*, xxxiii. 405) finds, that, if all the directions are strictly observed, the results do not vary at most more

than 0.1 per cent, and usually not over 0.05 per cent, from those of gravimetric analysis, but notes that these directions must be carefully followed. Faber (*Analyst*, xii. 6) obtained about the same results. Blythe (*Ibid.*, xii. 34) found in eleven trials a maximum error of 0.14 per cent, and an average error of 0.05 per cent.

— Ginn & Co. have ready this week 'Little flower people,' by Gertrude Elizabeth Hale, an interesting elementary work on flowers, designed to awaken an interest in plant-life among the youngest readers; also 'Outlines of logic,' by Herman Lotze, translated and edited by Prof. George T. Ladd of Yale college.

— Mr. William Cushing has been obliged to give up the publication of his proposed 'Anonyms' as a companion to his 'Pseudonyms.' This is to be regretted as a loss to American bibliography. There ought to be enough public-spirited institutions and individuals — booksellers and librarians — to whom such a work is an almost daily necessity, to offer Mr. Cushing and his publishers a guaranty against loss in completing a work so admirably begun.

— With the publication of the third volume of the history of Central America, now about ready to place in the hands of subscribers, but fourteen of the thirty-nine volumes of Hubert Howe Bancroft's works remain unpublished. The History company are gratified with the success that has attended the enterprise thus far; the growing favor in which each successive volume is held by the public, and the especially kind notices and reviews of the press, generally prove a very great encouragement.

— G. P. Putnam's Sons announce that when they have completed the publication of their edition of Franklin's works, of which the third volume is about to be delivered to subscribers, they will follow this with an edition of the 'Writings of Washington,' printed in similar style. The set, which will probably be comprised in twelve volumes, will contain the diaries, the addresses, and the correspondence, and will include a number of papers not before printed. Arrangements for the editing have been in train for some months, and the name of the editor will be announced shortly. The limited edition printed of the 'Franklin's works' is now all subscribed for, and the price of sets has already appreciated, as was the case with the 'Hamilton.'

— Messrs. Macmillan are going to issue this month the second volume of the 'Course of practical physics,' by Prof. Balfour Stewart and Mr. W. Haldane Gee, dealing with electricity and magnetism.

— Two years ago Professor Baird conceived the idea of procuring one of the prehistoric Easter Island idols to be added to the collection at the national museum. After much labor and patience, his efforts, aided by the government, have been successful, and the idol arrived in Washington on Monday last, together with a number of other valuable antiquities. The curiosities have been brought over without injury and without expense, naval vessels conveying them for the entire ocean-voyage. There are hundreds of these images on the island concerning which there is no knowledge whatever. One of them was taken from the island by the German government recently, and is now in the national museum at Berlin.

— The forthcoming report of the department of agriculture on the English sparrow will be a very interesting document. It will contain about four hundred printed pages, in which will appear the experiences of about thirty-two hundred people with this destructive biped. Dr. Merriam, the ornithologist of the department, who has charge of the preparation of the report, says that the indictment against the sparrow is a terrible one; and it has scarcely a friend in the whole country. Farmers who devote their time to the cultivation of grain, report that the sparrows, wherever they are thick, do frightful damage to cereals. Market-gardeners and the raisers of small-fruit, in the vicinity of cities, say, that, since sparrows began to multiply, the profits of market-gardening have almost vanished. The only known use for the sparrow is as a substitute for reed-birds. One man in Albany, N.Y., reports that he sells hundreds of dozens of sparrows every month to the restaurants in that city for reed-birds. They make excellent table-birds.

— The Smithsonian institution has just received a large collection of birds collected by Mr. Robert Henderson in the West India islands. Mr. Henderson, who has just returned from his trip, has been engaged in this work since last December, and has covered all of the islands except Ruatan, Turneff, and Cosomel in the lower part of the Caribbean Sea. He will make a second trip this summer to the above islands.

— The *West American scientist*, a monthly issued at San Diego, Cal., has enlarged to a twenty-four-page magazine with its third volume.

— The New York mineralogical club has recently been organized in this city. The objects of the club are, to create and stimulate an interest in mineralogy, and to collect, describe, and preserve all suitable material available in New York City and vicinity; such collection to be deposited in some public institution, so as to preserve a miner-

alogical record of places soon to be covered with buildings. It has been decided that all meetings of the club, if possible, shall be held at the residences of the members, for the purpose of examining collections as well as promoting sociability. Meetings will be held on the last Tuesday of every month, the chairman of each meeting to be the host of the occasion. The officers of the club are, George F. Kunz, secretary; B. B. Chamberlain, treasurer; Prof. D. S. Martin, Rev. J. Seldon Spencer, and Edgar A. Hutchins, executive committee; L. P. Gratacap and A. Woodward, curators. There are already over forty members on the roll.

— Mr. Stephen Salisbury of Worcester, Mass., has just given to the Technical institute of that city one hundred thousand dollars, to be used in the erection and equipment of a building for laboratories for mechanical, physical, and chemical science, as a memorial to his father, the late Stephen Salisbury, who for a great many years was president and chief patron of the institute.

— A remarkable illustration of the puzzling migratory habits of the herring has just been observed, says *Nature*, on the south-west coast of Norway, at the so-called Jaederen, between the towns of Stavanger and Egersund. This district used to be one of the richest herring-fishing grounds in Norway during the spring, but about twenty-five years ago the fish suddenly and completely disappeared from the coast. In March enormous shoals once more came under shore, first 'striking land' at the same spot as in former times. The quality of the herring is exactly the same as it was twenty-five years ago, and the shoals were accompanied by numerous 'herring' whales.

— According to *Engineering* for April 22, Russia proposes to press forward vigorously with the construction of the Samarcand railway from the Caspian Sea to the Amu Daria. It is stated that when the line is finished it will be possible to make a journey from Paris to Samarcand in seven days. The line will commence at Ouzoun-Ada, a small port on the Caspian, the distance from that point to the Amu Daria being in round figures 625 miles. Of this distance, 543½ miles of line are now entirely completed, and open for the conveyance of passengers and goods. The present terminus of the line is Tchardghoni, to which place it was completed Nov. 30, 1886. The construction of the line was commenced by General Arrenkoff in May, 1885, and 418½ miles were completed in eighteen months. The number of persons engaged in the construction was about 2,200. Not only was the permanent way laid through to

Tehardghoni in the course of the eighteen months, but houses and cottages for employees, a line of telegraph, and sand-sheds, were also established. The object of the sand-sheds is, of course, to protect the line against sand-storms, which constitute one of the difficulties with which it has to deal. Active preparations have been made for the construction of the remaining section to the Amu Daria: the necessary workmen have been collected, a large mass of materials has been brought together, and General Arrenkoff expects to complete the whole line through to Amu Daria by Nov. 15.

LETTERS TO THE EDITOR.

*.*The attention of scientific men is called to the advantages of the correspondence columns of SCIENCE for placing promptly on record brief preliminary notices of their investigations. Twenty copies of the number containing his communication will be furnished free to any correspondent on request.

The editor will be glad to publish any queries consonant with the character of the journal.

Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Comparative psychology.

PRESS of work has prevented me from replying before to a certain form of presentation, in *Science* for April 1, of my paper published in the *Popular science monthly* for March, on comparative psychology, and which really amounts very largely to a misrepresentation not only of what I think, but of what I actually expressed in the address referred to above.

It is assumed throughout by *Science* that I have ignored Professor Morgan's view of the case as to the study of animal intelligence, for it is stated that "he [the writer] has not faced this argument," etc., and "These limitations and considerations carry with them many consequences, but we can find in Dr. Mills's address no evidence that he has ever given them any consideration."

A few extracts from my own paper, followed by others from Professor Morgan's (in *Mind* for April, 1886), will test this matter. I am quoted in *Science* as saying, "Animals are the 'poor relations' of man; the latter is one of them, not only in body, but in mind. In not a few respects they are not only equal, but superior, to man." Professor Morgan says, "I am, moreover, fully persuaded that my four-footed friends have feelings and emotions distinctly akin to and dimly foreshadowing my own;" "I by no means deny the existence of animal mind;" etc.

Again he says, "A material difference in the ratio of the senses must, we may suppose, make a material difference in the mental product." He then alludes, as I do myself after the very passage *Science* quotes from my paper, to the superiority of the senses in the animals below man; for though *Science*, referring to my use of the expression 'lower' animals, says ironically, "We presume he uses the adjective 'lower' merely in deference to a custom of some antiquity," I have explicitly stated that it must be conceded that man as a totality stands at the head of the animal world, as the following extract will show: "The assumption that man is only accidentally the

superior of the brute would but lead to confusion, for it must be admitted that there is a scale, and that man ranks first. We are simply desirous of doing the lower creation that justice which we feel assured has not yet been allowed them, and of seeing the human family interested in those that we think scientific investigation is proving constantly are much more our fellow-creatures than has generally been supposed." "We are not contending for the equality of man and the rest of the animal kingdom," etc.

Again, *Science* represents me as saying that "man has only developed a superiority to the brute because of his social tendencies, resulting in the division of labour," etc.

Now, what I did actually write was as follows: "Man's present superiority over the lower animals is traceable in large part to his eminently social tendencies," etc., which is a very different thing; and I have elsewhere in the paper called attention to many other agencies which have tended to make man the supreme animal.

Professor Morgan holds, that, strictly, the only mind one can know is his own mind; that at best human psychology is a "psychology of sages, but not of savages; that all our knowledge of human minds other than our own is necessarily ejective; that our systems of human psychology hold good only for the philosophers who frame them; that our ejective inferences concerning our neighbours' minds, motives, and characters, are liable to error."

Now compare with this the following from my own paper: "And at this point allow me to indicate a danger that should make us cautious and modest in attempting to explain the behavior of animals. We infer from our fellow-man's behavior similarity of motive and mental processes to our own under like circumstances. We find, the more experience we have, that we are often at fault as to both. And when we are more free from the thralldom of so-called systems and methods in education, we may learn that the activities of the human mind cannot be reduced in all persons to precisely the one plan, like so much clock-work. This may mar somewhat the completeness and beauty of our philosophy of education, but it may also in the end conduce to human progress by providing the greater freedom, and end in insuring an individuality of character which seems to be now rapidly disappearing. Now, if individual men so differ in psychic behavior, how much more is it likely that still greater differences hold for the lower animals! An objection may be based, however, on this to the whole study of comparative psychology. The objection holds to some extent even for human psychology; but, as we infer similarity of behavior in men to denote similarity of inner processes, so are we justified in the same as regards the lower animals, though it must be conceded somewhat less so. We must always be prepared to admit that there may be psychic paths unknown and possibly unknowable to us in the realm of their inner life. But if we regard man as the outcome of development through lower forms, according to variation with natural selection—in a word, if man is the final link in a long chain binding the whole animal creation together, we have the greater reason for inferring that comparative psychology and human psychology have common roots. We must, in fact, believe in a mental or psychic evolution as well as in a physical (morphological) one."

How, in the light of these extracts, *Science* can say, "We can find in Dr. Mills's address no evidence that he has ever given them [Professor Morgan's views] any consideration," it is difficult for me to understand.

Now, Professor Morgan bases his belief in the mind of the lower animals on, 1°, "*the justification by results*. We habitually act towards our four-footed friends as if they were conscious beings, with results which point to the correctness of our hypothesis." 2°. "*The justification based on evolution*. Animals have inherited brain-structures in many respects similar to those possessed by man, and there is no reason for supposing that in them no psychoses run parallel or are identical with their neuroses." Now, the whole tenor of my paper shows that I have adopted a similar line of reasoning.

It will be perceived that up to this point Professor Morgan and myself are very much in accord. The difficulty which Professor Morgan feels in regard to all our knowledge of minds other than our own is one that occurred to me many years ago with great force. The views expressed in the address now under consideration were penned months before I had read Professor Morgan's paper in *Mind*; and it was with much gratification that I found my own opinions, formed independently, shared by so able a thinker. Professor Morgan's position may be logically impregnable; but while there is need for the greatest caution in regard to the 'eject' we form, it seems to me impossible for one, at least, who believes in the *evolution* of mind, to agree with Professor Morgan, "that our ejective inferences concerning their motives, minds, and characters, are so largely liable to error as to render the drawing of them unprofitable for purposes of scientific investigation, except in so far as they may aid the objective study of habit and activity."

Professor Morgan defines *intelligent* actions as "those which are performed by the individual, in virtue of his individuality; in special adaptation to special circumstances." Now, is it *possible* to understand this adaptation at all except by some sort of 'eject'? Professor Morgan's views, if pressed, strike at the root of all psychology as a science. There is great need of such caution, as he and I myself have urged; but the belief is irresistible that the inner life of the lower animals is not totally and radically different from our own.

It seems to me the whole difference between Professor Morgan and those who would, like myself, be a little less conservative as to the 'eject,' is that of mere *quantum*; and, as psychology does not admit of exact weighings and measurements, in the present state of knowledge it cannot be expected that men will agree as to how far we shall be justified in using the ejective method. But of one thing I am fully convinced, that the study of the psychology of the lower animals cannot but improve the highest, whether he considers himself of them or apart from them.

In conclusion, I think it will now appear that *Science*, Professor Morgan, and myself are much more in harmony than was supposed.

T. WESLEY MILLS.

Montreal, April 23.

[We print Dr. Mills's lucid communication with much pleasure. He brings out very clearly the fact which we did not gather from the reading of the address in question, namely, that he has not only read

but carefully weighed Professor Morgan's argument. We still think, however, that this fact is not readily inferrible from the original address without the emphasis of the present letter. — Ep.]

The relations of the International geological congress to geological workers.

A very wide-spread misapprehension exists of the purposes of the International geological congress which is to hold its fourth session in London next year, as well as of the definite steps it has taken in the way of recommendations to geologists.

In order to throw some light on the matter, the following list has been prepared, which includes all the points upon which the congress has expressed a decided opinion. It ought to be remembered that this congress has not any interest in maintaining this or that theory, but has been organized by geologists, of geologists, and for geologists (to slightly alter Lincoln's noble definition of our republic).

It has no authority but that of the influence of the large number of eminent geologists who either compose it or support its conclusions; yet when one considers the advantages which must result from agreeing upon a common scientific language (written and spoken) whereby widely separated observations may be made comparable, and may be utilized by persons of any nation as soon as they appear in print, to add to their own observations, and thus form base lines from which to triangulate to new generalizations, it does not seem to be a fatal objection to these recommendations either that they have not attained perfection, or that it may be found desirable with later experience to modify them.

It is apparent from the modest number of decided preferences which the congress has yet expressed, that it will not be difficult for any geologist to adapt to its large framework any provisional scheme which he may prefer. It is only those having strongly defined prejudices in antagonism to the broadest generalizations generally accepted among geologists, who will have any difficulty in joining in the acceptance of the recommendations of the congress.

1. The congress voted (solely for the purpose of bringing out the map) that a gray color should be provisionally chosen, of which different tints should be applied to the carboniferous and Permian (*Report of Amer. com.*, p. 20, ¶ 3).
2. Solely for the purpose of printing the European map, the committee on the map was authorized to select a color for the Silurian (Cambrian inclusive), but this choice was not to affect the scientific question connected with the classification at all (*Ibid.*, p. 21, ¶ 1).
3. The eruptive rocks were to be represented by seven tints, ranging from dark to light red (*Ibid.*, p. 21, ¶ 3).
4. The solution of other questions which might arise in the construction of the map were left to the committee on the map (*Ibid.*, p. 21, ¶ 4).
5. The congress decided that 'Archæan' should be the term applied to the group preceding the paleozoic (*Ibid.*, p. 23, ¶ 2).
6. The congress agreed to abandon Protogine as a division of rocks (*Ibid.*, p. 23, ¶ 10). The division of the Cambrian and Silurian was postponed till the congress at London.
7. The upper limit of the Devonian was placed at the base of the carboniferous limestone, that is to say, that the system comprises the psammites

of Condroz and the upper old red (*Ibid.*, p. 26, ¶ 1).

8. "The congress, not wishing to pronounce any view on the scientific question of the proper division of the Permian and carboniferous, preserves the classification as it now is" (*Ibid.*, p. 31, ¶ 4).

As to the tertiary and the eruptive rocks, no action was taken; but, for the purpose of bringing out the map, sufficient discretionary power was lodged with the committee (*Ibid.*, p. 32, ¶¶ 8 and 14).

This is all, and it does not look much like an attempt at usurpation.

As for the colors and symbols used on the map, they are purely tentative, and designed to furnish a test on a sufficiently large scale to enable all defects to be seen and subsequently corrected.

PERSIFOR FRAZER.

Philadelphia, May 2.

City feeding of milch-cows.

In *Science* for April 29 is an editorial note on the use of distillery slops in feeding milch-cows, in which you say, "It is well settled that distillery swill in any amount is an unnatural food for milch-cows, and that the milk produced from animals so fed is unwholesome and injurious." Will you please indicate the source of the 'ample evidence' which you claim 'will demonstrate' 'that distillery swill is totally unfit food for milch-cows?' I have tried to keep informed upon this subject, but have failed to find any trustworthy evidence to support your propositions. On the contrary, milk from swill-fed cows is often of better quality—so far as we are able to demonstrate this chemically—than milk from cows poorly pastured. The important point to remember, it seems to me, is that the animals should be well stabled. It is as important to the health of cows that their habitations should be clean, dry, warm, and well ventilated, as it is to human beings. If boards of health would see to this, the swill-milk problem would bother them in a much less degree than it does at present.

GEORGE H. ROHÉ.

Baltimore, May 2.

[In the report of E. H. Bartley, M.D., chief chemist of the Brooklyn board of health, made in 1886, occurs the following paragraph: "The very objectionable practice of feeding distillery waste—a practice that three years ago was, during the cold weather, almost universal—has been almost broken up. This result alone is of incalculable benefit to the consumers of milk, as such milk is without doubt a dangerous food for infants, especially in warm weather." In other reports by Dr. Bartley the question has been fully discussed, and the evidence therein contained seems to be conclusive on the unwholesomeness of this food. Some ten years ago the sanitary superintendent of Brooklyn communicated with the health officers of the large western cities where distillery swill was extensively used in the feeding of cows, and received from them statements which satisfied him that this material was entirely unfit for the food of milch-cows. As a result of this investigation into the subject, together with the experience had in Brooklyn and its vicinity, swill-feeding has not been permitted within the jurisdiction of the Brooklyn board of health. The New York state penal code, section 662, provides that a person who keeps a cow for the production of milk,

and feeds such cow upon any food that produces impure or unwholesome milk, is guilty of a misdemeanor punishable by fine and imprisonment. Section 669 states that the words 'impure and unwholesome milk' shall include all milk obtained from animals in a diseased or unhealthy condition, or which are fed on distillery waste, usually called 'swill,' or upon any substance in a state of putrefaction or fermentation. The most recent law passed by the New York state legislature touching this question is chapter 183, laws of 1885. This act declares that milk from animals fed on distillery waste is "unclean, unhealthy, impure, and unwholesome." We think that the general opinion of sanitarians is that the feeding of distillery waste to milch-cows should be prohibited rather than encouraged, which will be the effect of the Philadelphia regulation if enforced. — Ed.]

Queries.

1. ARCHEOLOGICAL AND ETHNOLOGICAL COLLECTIONS. — I am aware that considerable ethnological work is done by private persons and institutions in America, but the results of their researches are difficult to obtain. The queries of *Science* seem to me an excellent means of getting information which it would be difficult to obtain in any other way. Readers of *Science* will oblige me by informing me of name and place of private and public archeological and ethnological collections, particularly in the western parts of the United States and Canada. — FRANZ BOAS, 47 Lafayette Place, New York.

2. GASEOUS ENEMATA IN THE TREATMENT OF CONSUMPTION. — I desire to obtain results of the new treatment of pulmonary consumption and phthisis by gaseous enemata, for publication in *The polyclinic*. The correct therapeutic value of this method can only be arrived at by the collection of statistics, and I therefore request any one who has administered the gas to communicate the result to me, the formula used, and any special information that may be useful. — HENRY LEFFMANN, editor of *The polyclinic*, P.O. box 791, Philadelphia.

3. ORIGIN OF CONSUMPTION. — I have been much interested in the theory of consumption which has been suggested by Mr. Hambleton, and which was described in *Science*, ix. No. 221, but cannot agree with all his inferences. He says that the natives of America, Africa, and the South Sea Islands were entirely free from consumption till they came into intimate relationship with civilized Europeans, and that the disease then came among them because they adopted the habits of the civilized nations. This seems to me to be a very weak argument. The same is true of syphilis, small-pox, measles, and other diseases, and yet I presume no one would explain their introduction in this way. Is not the fact stated by Mr. Hambleton one of the strongest arguments in support of the contagious theory of consumption? Not until the germ, the bacillus tuberculosis, was introduced, did the disease occur, and then it spread among the natives in the same manner as small-pox and other communicable diseases. That narrow chests and impeded respiratory movements are conditions favorable to the production of consumption no one doubts, but that they can actually produce the disease seems incredible. — MEDICUS.

SCIENCE.—SUPPLEMENT.

FRIDAY, MAY 6, 1887.

ETHNOLOGICAL NOTES.

The tribes of Sierra Leone.

THE journal of the Anthropological institute, for February, 1887, contains a description of the tribes of Sierra Leone, by T. R. Griffith. The colony is not the place to study the characteristic features of African man, as its population is a conglomerate of an enormous number of African tribes, the colony having been for many years the place to which were carried all liberated slaves rescued by British men-of-war. It is of considerable interest to study the development of such an aggregate of natives of various parts of Africa, particularly as they are under the influence of powerful and homogeneous tribes which inhabit the interior. Griffith states that the amalgamation of these elements is going on very slowly, and that exclusive tendencies still prevail. A peculiar dialect of the English language is now spoken by the inhabitants. Besides the population of liberated slaves, we find the so-called Nova-Scotians and the Maroons. The former are the descendants of American negroes who had fought under the English flag in the American war, and were first transferred to Nova Scotia, then in 1792 to Sierra Leone. The Maroons had lived in the mountains of Jamaica, and had claimed their freedom when England took that island from the Spaniards. The latter are mixed with Spanish and probably Carib blood. They have a quarter of their own in Freetown. Both Nova-Scotians and Maroons are remarkable for their dislike of agriculture. There are some permanent residents from other parts of Africa, who form a distinct part of the population,—the Akus, who are liberated slaves from Yoruba, a state west of the Niger and near Lagos; the Ibos, from the same country; and the Krumen. The last-mentioned people are the well-known seamen of Africa, who serve on European steamships, and are the most industrious of the coast tribes. Their home is east of Cape Palmas. In Freetown they occupy a quarter of their own, the population of which is almost entirely masculine. There are several large rivers in this district, of which the Sarcies and Rockelle are the most important. The country between these rivers is inhabited by the Timene (Timmani), who formerly possessed the

peninsula of Freetown also. Their northern neighbors are the Susu,—a people of mixed origin, being originally a branch of the Mandingo, who conquered their present country, and intermarried with its former inhabitants, the Bagas. The Mandingos occupy the highlands east and south-east of Sierra Leone. It seems that the state of all these tribes has little changed since the beginning of this century: for the description of Major Laing, who travelled in the Timene country in 1827, agrees well with Griffith's remarks. The Mandingos are Mohammedans, while among the other tribes the ancient belief still prevails. The Mendes, who live south of the Timene, are, according to Griffith, "thorough pagans, and probably there is no tribe near to Sierra Leone that indulges so much in superstitions of every description." Among the Susu and Timene there are many Mohammedans. Besides these, the Sherbro and Vei live in the colony, the latter being well known on account of the invention of a written language.

Among the peculiar institutions of these tribes, the secret societies, which have a great influence on public life, are particularly remarkable. There is a society of women, called Bundu, and another one of men, called Porô. The initiation, which takes place when the children come of age, is celebrated with great ceremony. The girls are led into the woods and kept in seclusion for one moon and one day before they are allowed to return into the village. At the end of the term they receive Bundu names with great ceremony and gesticulation by some who personate 'Bundu devils' with hideous masks. The girls are then publicly pronounced marriageable. The following illustrations are three of these masks which were exhibited in the London colonial exhibition. Fig. 1 is a large white mask with red mouth and black mustache and hair, ornamented with white bark. The dancer wears, besides this mask, a belt and arm and leg ornaments of white bark. Fig. 2 is a 'Bundu devil' of the Sherbro. The whole mask is black, and so are the fringes of bark that are fastened to its lower rim. Fig. 3 is another 'Bundu devil' with a beautiful hair dress, earrings, and shells in place of the eyes. Masks of this kind are used all over West Africa. In Central Africa masks are not unknown, some being found on the left tributaries of the Kongo, others in Lunda.

The initiation of the men is called Porô or Purû, and so is their secret society. Griffith distinguishes two kinds of Porô,—the religious and the

political. The Porô is a very powerful institution, which exerts a great influence over the destiny of those countries, and in reality supersedes the power of the chiefs. The Porô arranges the affairs of the tribes, settles disputes, and makes laws. Even intertribal wars are sometimes stopped by its arbitration. Its representatives or messengers are always held sacred, and nobody dares to disobey its commands. All travellers who have entered the interior of this part of

Besides these specimens, unworked pieces of nephrite were found in Alaska by Capt. A. Jacobson, who affirms that the Eskimos find it *in situ*. This proves that the material is found in several parts of north-western America. According to Dawson, the implements occur as far inland as the Caribu and Gold mountains, while farther inland they are rarer. The late Prof. H. Fischer and other scientists were of the opinion that jade and nephrite came exclusively from Asia, and consid-

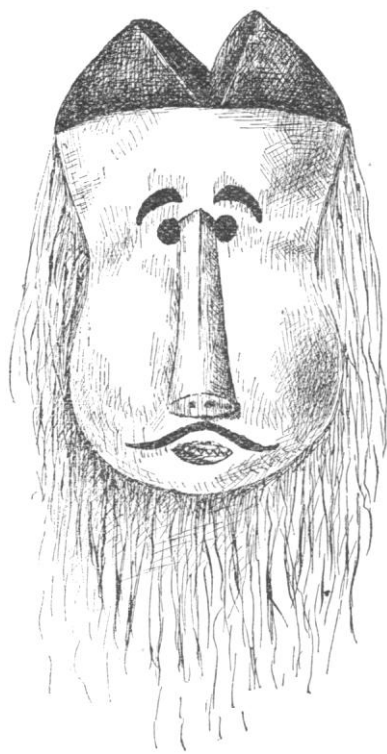


FIG. 1.

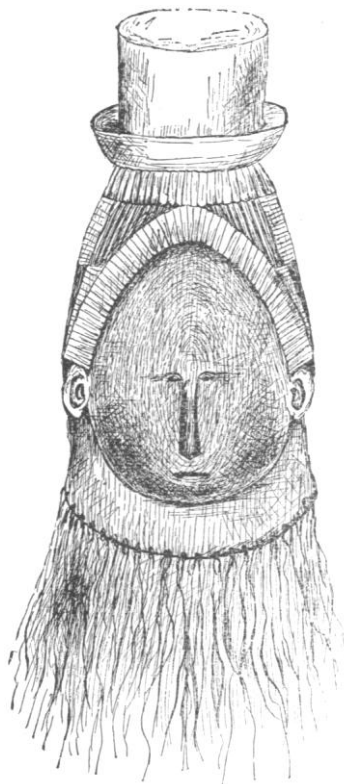


FIG. 2.



FIG. 3.

Africa tell of the predominant influence this institution exerts in the states of the Mandingos and their neighbors.

DR. GEORGE M. DAWSON contributes an important paper on the much-discussed jade question (*Can. record of science*, April, 1887). He describes two partially worked bowlders of jade which were found at Yale and Lytton in British Columbia. The occurrence of these pieces makes it evident that the material was worked at that place by cutting the hard stone by means of a thong or a thin piece of wood in conjunction with sharp sand.

ered its occurrence in Europe and America as a proof of early migrations. In a paper published after his death (*Archiv für Anthropologie*, 1886, p. 563), Fischer gives a very complete list of nephrite, jade, and chloromelanite objects found in Europe, which is illustrated by a map of Europe showing their distribution. The principal features of the map are the absence of nephrite in France and Germany, while jade and chloromelanite implements are scattered all over the country. Speaking in a general way, the Elbe forms the eastern limit of the distribution of these implements. Nephrite is almost exclusively found on

the lakes of Switzerland, particularly on the Lake of Constance. A few specimens have been found in Sicily, Greece, and Asia Minor. Fischer concludes from these facts that the implements were brought to Europe by a nation immigrating into France from the coast of the Mediterranean Sea, and that the material came from Asia. He supposes the same to be the case with the nephrites of the Swiss lakes. His principal reason for adopting this theory is the failure of all attempts to find the material in Europe. He is convinced that geologists and mineralogists would be just as able, to find it as the natives, in all parts of the world who discovered the usefulness of the hard and tenacious mineral, and found it in considerable quantities, which are now scattered over countries where it does not exist *in situ*. As Fischer does not prove that the European nephrite is identical with any Asiatic variety, and his conclusions derived from the distribution of the objects are rather forced, his views on the subject fail to convince us.

—A Catholic missionary was sent by Bishop B. A. Thiel of Costa Rica to the Tule or Cunos Indians of the villages of Paya and Tapaliza in Darien. His observations on these tribes have been published in *Petermann's Mittheilungen*, 1886, No. 9. Though a great number of the natives have become Christians, some of their ancient customs still prevail. The men leave the greater part of the work to the women. They go fishing or hunting, and cut wood: the women cultivate the fields. All of them drink great quantities of chicha, an alcoholic drink made of corn. They are monogamists, and the women are very chaste, adultery being of rare occurrence. The marriage is concluded in presence of the chief. Illegitimate children are drowned in the river, and the mother is severely punished. Their mortuary customs are remarkable. They dig a pit between two trees, and put the corpse into a hammock, which is fastened to the trunks, so that it hangs over the pit. Then it is covered with branches, boards, and earth. Chicha and corn are deposited in the grave. They believe that the soul does not come to rest until the ropes of the hammock are rotten and the corpse is fallen into the pit. The Indians of Tapaliza are more civilized, and do not practise these mortuary customs. Illegitimate children, however, and widows who give birth to a child after the death of their husband, are drowned. The missionary made a reliable census of the villages, which shows that Paya has 218, Tapaliza 112, inhabitants.

—In the *Archiv für Anthropologie*, 1886, p. 591, we find a German edition of B. A. Thiel's vocabu-

laries of the Costa Rica languages, which were published at San José de Costa Rica in 1882. W. Herzog compares these Bribri dialects with other American languages, and finds that a great number of Tupi roots occur in the words of these dialects, and that the language probably belongs to the same stock.

—*Nature* says that Tippto-Tip, the famous African trader, came upon a remarkable tribe on the Kongo, to the north of Nyangwe, who do a great deal of work in copper, and whose inlaid work in that metal is of a highly artistic character. Among the same people, enormous spear-heads of very thin copper are made, some six feet in length, which serve as a kind of currency. Probably these are the Basonge, who make work of this description. It is well known that the tribes of

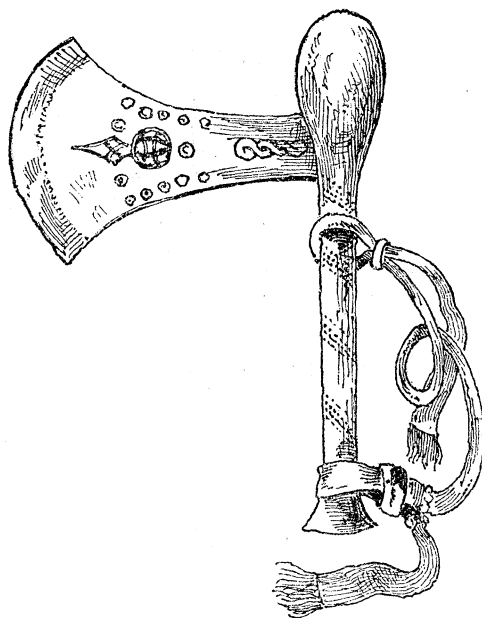


FIG. 4. — BATTLE-AXE OF THE BASONGE FROM LUKASI RIVER (15½ by 9¾ inches).

central Africa are very skilful blacksmiths and carvers. Wherever explorers entered those parts of the continent where the native industries were not deteriorated by contact with the whites, the spears, arrows, and fetishes are beautifully made. The accompanying sketch is drawn from an ornamental battle-axe of the Beneki, a tribe of the Basonge. The ornaments are of copper, laid into the iron blade. The handle is covered with the skin of a snake. Iron spear-heads of enormous size, which are used in festivals or as a kind of currency, are in use among the tribes of the upper Kongo,

HEALTH MATTERS.

Sanitary science in New Jersey.

THE tenth annual report of the state board of health in New Jersey, just issued, is fully up to the standard of excellence which that board has for a number of years maintained in its reports. For a considerable period sanitarians were accustomed to regard the annual report of the Massachusetts board of health as the model for health reports; but, when this board was merged into that of charities and lunacy, this distinguishing characteristic was lost, and to the reports of New Jersey and Michigan the meed of honor was awarded which was formerly awarded to those of Massachusetts.

In the beginning of this report, which is made to the governor of the state, Dr. Hunt, the able secretary of the board, pays a deserved tribute to sanitary science, and to the progress which it has made not only as a science, but as an art, during the past decade. He regards this progress as one of the most important and notable achievements of the age, and directs attention to the fact that practitioners of the healing art have not only recognized it as essential to their calling, but have interwoven many of its principles not less with the treatment of disease than with its prevention. Dr. Hunt refers to the great improvements which have been made in the sewerage of the cities and towns of the state, notably Atlantic City, Orange, Long Branch, and Newark. Several subjects of importance are discussed by the secretary in this portion of the report, among them being the action of water upon lead pipes, the filtration of water, bathing accidents, the regulation of cemeteries, hydrophobia, small-pox and vaccination, summer resorts, contagious diseases, sanitary oversight of schools, the history of the cases of sickness from ice-cream and milk, diseases of animals as related to human health, and the sanitary education of health inspectors. In writing on this latter subject, Dr. Hunt says that sanitary fitness for advice or administration requires special training and the acquirement of knowledge from various departments. It is not until one comes to recognize it as demanding special study and practice that either it or the individual find their proper place. In eleven of the leading colleges of Great Britain, including the universities of Oxford, Cambridge, Edinburgh, Glasgow, and Dublin, special diplomas or degrees are given for public-health qualifications. In Great Britain and its provinces there are now about two hundred and fifty of these authorized practitioners. In addition to this, the Sanitary institute gives certificates to those who successfully pass the examination.

It has been the practice of the New Jersey board, in its annual reports, to publish special papers on various subjects connected with sanitary administration, and in this report the same plan has been followed. The disposal of house-sewage in districts not provided with sewers is treated by C. P. Bassett, C.E.E.M., of Newark, in one of these papers. He condemns privy-vaults and cesspools, and praises the pail system, which has reached such perfection in Rochdale and Birmingham. In the latter city this method has reached enormous proportions; more than 40,000 pails, representing 250,000 people, being collected weekly, and carried in specially constructed wagons to the dumping-station. At this station the contents are placed in a tank, treated with sulphuric acid to fix the ammonia, dried, and bagged for sale. At Rochdale, a city of 70,000 people, the pail system costs annually less than ten cents a head. J. J. Powers, sanitary plumber of Brooklyn, contributes a paper on the work of the plumber and the disposal of sewage. This was read at the meeting of the New Jersey sanitary association, and has already been referred to in *Science*. Professor Brackett of Princeton has prepared a paper on the physical laws of pipes and fixtures, and their contents. Illuminating-gas, its history and its dangers, is discussed by J. H. Raymond, M.D., of Brooklyn. In it a concise description is given of the various methods of gas-manufacture and the fixtures in ordinary use in gas-lighting. This paper is illustrated with twenty-seven illustrations. The paper on drinking-water and typhoid-fever, by D. Benjamin, M.D., has already been mentioned in *Science*. C. Phillips Bassett, C.E.E.M., contributes a paper on roads and streets as sanitary measures, and how to construct them, in which he discusses the advantages and disadvantages of the different materials used in road-making, their cost, methods of preparation, and use.

One of the most interesting subjects discussed in this report is the hygiene of occupations. In the general introduction, written by Dr. Hunt, the diseases which affect workers in iron and glass are described, and suggestions are given for the remedying of the evils which surround this class of artisans. Among the workers in iron, the 'boilers' and their 'helpers,' stripped to the waist, are exposed to the intense heat of the puddling-furnaces, and, while perspiring from every pore, gulp down large draughts of ice-water, or stand in the open air or in a stiff river-breeze. Such sudden coolings are liable to cause congestions, which may be followed by some of their manifold consequences. The nailers suffer from 'nailer's consumption,' due to the inhalation of minute parti-

cles of iron and steel. The peculiar diseases of the glass-workers are burns, catarrh caused by the irritation of the sand, soda, lime, arsenic, and manganese used in the manufacture of glass, emphysema of the lungs, and hypertrophy of the heart, due to over-distention of the lungs from long and hard blowing.

The diseases of hatters are described by J. W. Stickler, M.D., of Orange, to be catarrh, rheumatism, 'shakes,' mercurial sore mouths, and pulmonary affections. Diseases of the lungs seem to be the most fatal form of illness among hatters; 63.5 per cent of all the deaths being due to this class, 51.8 per cent being caused by consumption alone. It is doubtful if any other trade will show such an excess of deaths due to pulmonary phthisis. The average life of hatters does not exceed forty years.

Dr. Newton of Paterson contributes an article on the diseases of workers in silk, flax, and jute. Those who are engaged in dyeing the silk suffer from bronchial, pulmonary, and rheumatic affections, induced by the hot, moist atmosphere of the dye-house, and to inflammation of the skin of the hands and arms, caused by the irritant action of the dyes. Taken as a whole, however, the trade of silk-operatives may be considered a healthful one, and devoid of the dangers common to many of the textile trades. Those who work in flax and jute are, on the contrary, subject to great dangers to their health. The 'hacklers,' those who draw the flax or jute through steel combs in order to arrange the fibres in a parallel direction, and to remove short threads and dirt, are a short-lived class. Only from fifteen to eighteen out of a hundred survive, or enjoy good health at the age of forty. This is due to the irritant action of the dust on the lungs. A person entering one of the rooms where this work is being done, from the fresh air, is immediately seized with paroxysms of coughing. The same is true of the spinners as of the hacklers. Hemp and flax dressers inhale a dust which is peculiarly irritating; and so fatal is the result, that, if a girl of eighteen commences with this work, and is regularly employed, she nearly always dies of consumption before reaching the age of thirty years.

The diseases which occur in the manufacture of rubber boots and shoes are described by J. P. Davis, M.D., of Milltown. One of these is lead-poisoning; from six to twelve pounds of litharge and white lead being added to every twenty-four pounds of gum, for the purpose of drying the rubber and giving it weight. The pressure of the last against the pit of the stomach causes soreness of the muscles, congestion of the abdominal organs, and dyspepsia. In addition to this, acci-

dents from machinery are not infrequent, the sticky rubber drawing a hand or an arm between the rollers. This series of papers on the hygiene of occupations is a most interesting and instructive one, and cannot but do great good by directing public attention to the dangers, many of which are remediable, of artisans in occupations which are usually considered healthful and free from danger of all kinds.

The entire report is a most valuable one, and should be in the library of every one interested in the public health, as a book of reference.

THE report of the dairy commissioner of the state of New Jersey for 1886 treats entirely of matters relating to imitation-butter, and is worthy of notice for a fairness and moderation usually conspicuous for its absence from publications relating to this subject. Aside from the report of the commissioner, it contains a somewhat extended paper upon the history and methods of manufacture of imitation-butter, and the sanitary, commercial, and legal questions relating thereto, also by the commissioner; a paper upon the chemistry of butter and its imitations, by Prof. H. B. Cornwall; a description of a method of identifying and determining coloring-matters in butter, by Prof. Albert R. Leeds; and various matters relating to the state law and its construction by the courts.

— 300,887 immigrants arrived at Castle Garden, New York, during 1886, an increase of 30,748 as compared with 1885. 997 were returned to Europe: of these, 70 were insane, 20 idiotic, 1 blind, 88 were enceinte, 8 were convicts, and 18 cripples, 350 suffered from diseases which rendered them unable to earn their living, and 437 had no means of support.

— The number of persons of unsound mind in England and Wales, Jan. 1, 1886, as reported to the commissioners in lunacy, was 80,156, exclusive of 248 chancery lunatics, residing with their committees, and 81 insane convicts, — a gross increase during the year of only 452 patients. The number of registered lunatics in Scotland on the same date, apart from 62 persons in the lunatic department of the general prison at Perth, and 230 imbeciles in training-schools, who are registered separately, was 10,895, — an increase for the year of 268. The total number in Ireland was 14,415, — an increase of 136. This gives an aggregate of 105,466 insane (including some idiots with them) in public and private institutions for lunatics or establishments for paupers, or boarded out, and subject to governmental inspection; and the total increase in twelve months was 856.

THE UPRIGHT POSITION IN MAN.

DR. GUY HINDSDALE of Philadelphia has carried out a suggestion of Dr. Weir Mitchell's to a very interesting conclusion (*Amer. journ. med. sc.*, April, 1887). The suggestion consisted in the desire to record accurately the swaying to and fro and from side to side which every one feels himself involuntarily making when trying to stand perfectly still. Placing the heels and toes together, with the hands hanging from the sides, the head erect, and the eyes directed to a fixed object, a silk thread was attached to the forehead, passed over a pulley, and was connected with a rod moving vertically and carrying an index. The index recorded on the smoked surface of a revolving drum. A fall of the line on the drum indicated a forward movement of the head, and an upward line a backward movement. The lateral movements of the head were similarly resolved into the downward and upward tracings of a second index. A third curve recorded the respiration, and a fourth marked seconds.

Another method of recording the sway consists in placing a flat piece of cardboard with a smoked surface upon the subject's head, and have him stand under an index free to move up and down in a fixed line. The resulting tracing shows the continuous movements which occurred. This method is coarser than the other, but has practical points of interest for clinical purposes to which it has already been applied.

Without exception, all persons, including the most healthy, swayed both forward and backward and from side to side. The first movement is generally the more extensive, and is, on the average, one inch, while the lateral sway averages about three-quarters of an inch in normal adults. The first movement is almost invariably forward, then a counterbalancing movement backward with a tendency towards the right. The rate of the movement shows a rhythmical tendency of about fourteen per minute, with a respiration of about twenty-two per minute. The significance of this rate has not yet been ascertained, and its constancy suffers many deviations.

An interesting observation is the common tendency of falling forwards and towards the *right*, which at once suggests all the problems of bilateral asymmetry. The suggestion is borne out by further trial; for, while right-handed people almost invariably are inclined to tilt over to the right, of twenty-two left-handed people, twelve inclined towards the left. This agrees well with the observations that the right arm is heavier and larger than the left, and thus brings the centre of gravity on the right side. That this is co-ordinated with an increased development of the left brain is

well made out, and receives its final confirmation in the fact recorded by Flechsig, that more fibres cross over in the pyramidal decussation from the left brain to the right side than *vice versa*.

That the eyes are used to correct these swayings is well proved by the fact that, with the eyes closed, the sway is increased by about fifty per cent. So, also, absence of fixation of the eyes, reading aloud, removal of the shoes and stockings, materially increase the sway.

Children sway absolutely more than adults, and there is greater equality in their case between the antero-posterior and the lateral sway. Twenty-five girls showed an average lateral sway of 1.06 inches, and an antero-posterior sway of 1.08 inches, which was increased by about forty per cent when the eyes were closed.

Thirty-nine blind persons gave an average lateral deviation of 1.4 inches, and an antero-posterior deviation of 1.7 inches, which is about the same as that of seeing persons with closed eyes, thus suggesting that the years of experience have been of no avail in making the blind keep a truer equilibrium than seeing persons momentarily deprived of sight. In deaf-mutes the lateral sway was .93 of an inch, and the antero-posterior .85, which averages became 1.18 and 1.31 with closed eyes. All except two of these (all were right-handed) swayed towards the right. (Incidentally the observation of Professor James, that deaf-mutes are less liable to dizziness than normal persons, was confirmed.)

From the clinical side, it was found that ether exaggerates the normal sway considerably without introducing other peculiarities. In locomotor ataxia (characterized by unsteadiness and uncertainty of the gait) the sway with the eyes open in several cases was observed to vary from 2.25 to 3.75 inches on the antero-posterior line, and from 2.50 to 3.25 laterally. Six observations with the eyes shut show a lateral sway of from 3 to 6 inches, and an antero-posterior sway of from 3 to 7 inches. A case of spastic paralysis showed the deviations almost entirely in the antero-posterior line, while in chorea the difference between the deviations in the two directions is marked, and both are exaggerated (lateral, 1.45 inches; antero-posterior, 2.35 inches).

Dr. Hindsdale justly claims for these observations considerable suggestiveness for physiological research and direct clinical utility.

FLORIDA GEOLOGICAL SURVEY.

FOR the first time in the history of the state, Florida has instituted a geological survey of its territory. The survey is not yet fully organized; but a preliminary report of thirty-one pages, on

the geological features of the state, has been prepared by Dr. J. Kost. Florida has never been a very promising geological field, the rocks being effectually concealed almost everywhere over its level surface by extensive quaternary and recent deposits; while the facilities for geological observation afforded by artificial excavation and river and coast erosion are very meagre. Enough facts, however, have already been determined to show that Florida can no longer be regarded as simply a long stretch of sand deposited on a series of coral reefs. Every member of the tertiary series has been identified in the state, and the lowest division or eocene, especially, is of considerable extent and thickness. A low anticlinal axis runs down the peninsula midway between the east and west coasts. This uplift appears to have occurred at the close of the eocene, since the later rocks differ in character on the two sides of the ridge. Those of the east side are chiefly the coquina or shell limestone; while those of the west side are coralline and shelly limestone, and sandstone, with much siliceous material. In most parts of the state, all the formations, and especially those newer than the eocene, are often exceedingly cavernous; branching channels, with running streams into which numerous sink-holes descend from the surface, constituting an extensive system of subterranean drainage. In numerous instances these subterranean streams reach the surface at lower levels, forming springs of great size and force. Under the head of geological principles, the physical and geographical features of the state in the successive epochs, and the sources of the different kinds of sediment, are discussed at some length. The sandy and seemingly barren soil of Florida is shown, by statements concerning its composition and agricultural products, to possess virtues not suspected by the casual observer. Not only is the soil much better than it has been represented, but it is shown that the state is not lacking in materials for improving it to any desired extent. Shell marl is abundant in all parts of the state, and the discovery of important phosphate deposits similar to those of South Carolina is announced. Aside from the marls and phosphates, the mineral resources of Florida are very limited, including, however, some building-stones and clay-beds, and indications of lignite and iron ore.

MR. AND MRS. E. W. MORSE, pioneer members of the San Diego society of natural history, have recently presented that association with a lot near the post-office, valued at over twelve thousand dollars. By the conditions of the gift, the society will erect a building.

RELATION OF THE STATE TO INDUSTRIAL ACTION.

PROFESSOR ADAMS has given us a pamphlet that is not only critical but constructive, and it is the ablest monograph that the Economic association has yet issued. It is not altogether new, for its substance was read some time ago as a paper before the Constitution club of New York City, and published by the club with the title "Principles that should control the interference of the state in industries." In its present form, however, the argument is both revised and extended.

The author's plan of procedure is simple and suggestive. He first takes up the *laissez-faire* theory, analyzes it, and finds it inadequate as a guide in constructive economics, and then develops his own principles for the regulation and limitation of state interference. Professor Adams finds himself unable to follow Mill's dictum that every departure from *laissez-faire*, unless required by some great good, is a certain evil. He finds the presumption against state activity an insufficient principle upon which to base constructive efforts. He, moreover, regards the modification of the English system of economics for which Professor Cairnes is largely responsible as no improvement. "In its original form, it [English economics] was conclusive as an argument though based upon an erroneous premise; in its modernized form the error of its premise has been corrected, but its conclusiveness as an argument has thereby been destroyed" (p. 25). As modified, the doctrine of *laissez-faire* cannot lay claim to scientific pretension, and amounts to nothing more than a declaration in favor of the wisdom of conservatism.

In seeking to replace this now discarded principle, Professor Adams finds some obstacles, owing to the general failure to distinguish clearly between *laissez-faire* as a dogma and free competition as a principle. "The former is a rule or maxim intended for the guidance of public administration; the latter is a convenient expression for bringing to mind certain conditions of industrial society" (p. 32). Over against the prevailing English maxim with its presumption in favor of the individual, on the one hand, and against the prevailing German maxim with its presumption in favor of the state, on the other, the author brings forward this principle, distinct from both, as the starting-point for constructive study: "It should be the purpose of all laws touching matters of business, to maintain the beneficent results of competitive action while guarding society from

Relation of the state to industrial action. By HENRY C. ADAMS. Baltimore, American economic association. 8°.

the evil consequences of unrestrained competition" (p. 35).

Unrestrained competition, Professor Adams argues, results in important evils of three sorts. First, it tends to bring the moral sentiment pervading any trade down to the level of that which characterizes the worst man who can maintain himself in it. Secondly, it renders it impossible for men to realize the benefits that arise, in certain lines of business, from organization in the form of a monopoly. Thirdly, the policy of restricting public powers within the narrowest possible limits tends to render government weak and inefficient; and a weak government, placed in the midst of a society controlled by the commercial spirit, will quickly become a corrupt government. In these three important respects *laissez-faire* fails. Therefore the principles for state interference which Professor Adams lays down are three, one corresponding to each of the above evils: 1°. The state may determine the plane of competitive action; 2°. The state may realize for society the benefits of monopoly; 3°. Social harmony may be restored by extending the duties of the state.

To use the author's own language, "This essay may be regarded as a plea for the old principle of personal responsibility as adequate to the solution of all social, political, and industrial questions; but it is at the same time urged that this principle must be accepted fearlessly, and applied without reserve. . . . [Monopolies], it is claimed, should be controlled by state authority, and it is suggested that the American theory of political liberty will lead men to rely as far as possible upon the efficiency of local governments in the exercise of such authority" (pp. 84, 85).

In some particulars we find ourselves obliged to differ with the author, both as to principles and as to applications; but his argument is clear and straightforward, and we bear cheerful testimony to its ability and its candor.

GRASSES OF NORTH AMERICA.

It has sometimes been urged, as an argument against the establishment of agricultural schools, that there were no adequate text-books in which the student might find, systematically arranged and classified, the knowledge of agricultural matters acquired by the farmer on the one hand, and the student on the other. There has been, to, a sufficiently large grain of truth in the accusation to cause us to welcome such additions to agricultural literature as Storer's 'Agriculture,' recently noticed in these columns, and Beal's 'Grasses of North America.' Both these books, in quite

Grasses of North America, for farmers and students. By W. J. BEAL. Vol. i. Lansing, Thorp & Godfrey, pr. 8¢.

different ways and in quite distinct fields, go far to fill what were serious gaps, and the future student of agriculture will owe both authors a debt of thanks.

Although written by a botanist, and informed throughout by botanical knowledge, 'The grasses of North America' is a book for the farmer rather than for the botanist. The chapters upon the structure, form, and development of the grasses, the power of motion in plants, plant growth, and on classification, while containing much valuable matter, are really preliminary to the succeeding chapters upon more immediately practical topics.

In these the author has collected the results and opinions of the leading authorities of this and other countries, and added much valuable original matter upon such topics as the adaptation of the various cultivated grasses to different purposes and different conditions of climate and culture, the preparation of the soil, the care of grasslands, making hay, etc. A chapter upon the insect enemies of grasses and clover, by Prof. H. J. Cook of the Michigan agricultural college, and one on the fungi of forage-plants, by Prof. William Trelease of the Shaw school of botany, St. Louis, conclude the book, which deserves a wide circulation among the farmers and students for whom its title designs it. It should be added that the abundance of excellent illustrations greatly adds to the value of the book. A second volume is in preparation, to contain the description of all known grasses of North America, with full notes on their value for cultivation.

THE initial publication of the Henry Draper memorial is issued by Professor Pickering as the 'First annual report of the photographic study of stellar spectra, conducted at the Harvard college observatory.' With the Draper 11-inch photographic telescope, spectra have been obtained which we believe have not been equalled elsewhere; and Mrs. Draper has decided to send to Cambridge a 28-inch reflector and its mounting, and a 15-inch mirror, with which Dr. Draper's photographs of the moon were taken. But, what is more important, Mrs. Draper has not only provided the means for keeping these instruments actively employed, some of them during the whole of every clear night, but also of reducing the results by a considerable force of computers, and of publishing them in a suitable form.

— The tenth annual meeting of the American society of microscopists will be held in Pittsburgh, Penn., commencing Tuesday, Aug. 30. Prof. W. A. Rogers, Waterville, Me., is the president; and D. S. Kellicott, Buffalo, N. Y., secretary.